

EAGE

EUROPEAN
ASSOCIATION OF
GEOLOGISTS &
ENGINEERS



Fifth EAGE Workshop on Borehole Geophysics

BRIDGING THE GAP BETWEEN SURFACE AND RESERVOIR

18-21 NOVEMBER 2019 • THE HAGUE, NETHERLANDS

- **Final Announcement & Technical Programme**

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WORKSHOP OVERVIEW

Despite the challenging circumstances the industry has experienced in the past few years, the support and interest in the EAGE Borehole Geophysics workshops have not only remained strong but broke a record in the number of delegates at the fourth workshop held in Abu Dhabi in 2017. This continued success has persuaded the technical committee of the workshop to plan and prepare the program and venue for the fifth in the series to be held 18-21 November 2019 in The Hague, Netherlands.

In previous workshops, the quality of the technical submissions has been excellent with representation from a wide cross-section of the industry from around the world; operators, consultants, contractors, and academics. For this fifth workshop, we anticipate using the same proven formula by providing a forum for professionals interested in borehole geophysics to share latest research findings, case studies, successes and lessons learned, all built around a technical program of oral papers and posters.

Borehole geophysics is a key component in linking surface measurements with the reservoir; data acquired in the well provide high resolution geological and geomechanical measurements vital to validate and constrain the processing of surface data (e.g. surface seismic) used across the field. Although the technical program may have a principal focus on acquisition and processing of borehole seismic data (Vertical Seismic Profiles), this workshop will be open to discussion of a wider range of geophysical techniques that utilize gravity, electromagnetic (EM), and microseismic surveys, to name but a few. This workshop also welcomes discussions on advances in borehole geophysical data processing, including Full Waveform Inversion and Artificial Intelligence, and solutions enabled by data analytics and cloud computing.

The workshop will be divided into four distinct sessions:

1. Latest Borehole Geophysics Data Acquisition Technology
2. Pushing Borehole Geophysical Data Processing
3. Integration of Borehole and Surface Geophysical Methods
4. Bridging the Scale Gap in Reservoir Characterisation and Monitoring

SHORT COURSE

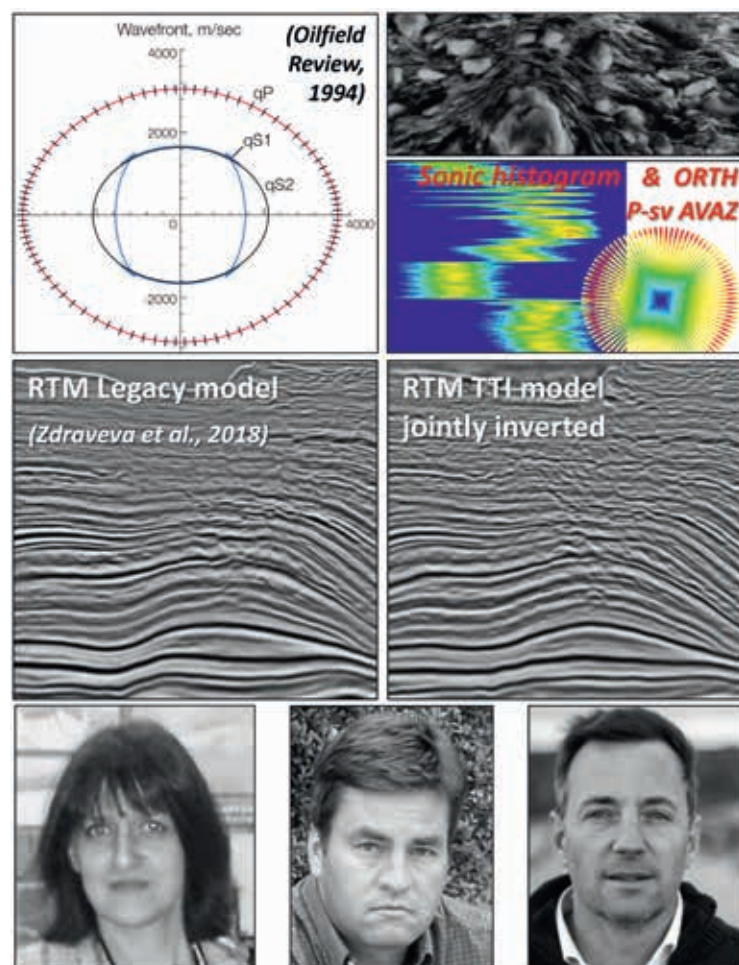
Monday 18 November 2019

Advanced Elastic Anisotropy Calibration: From Borehole to Seismic Scales

By: Olga Zdraveva (*Depth Imaging Advisor, WesternGeco*), Scott Leaney (*Microseismic & VSP Advisor, Schlumberger*) and Erik Wielemaker (*Sonic Expert, Schlumberger*)

An accurate characterization of the anisotropic elastic properties of subsurface formations is key to both geomechanical and geophysical applications. Borehole sonic and borehole seismic are a rich source of measurements of the dynamic elastic behavior of formations, providing key in-situ constraints to surface seismic studies. In most published cases, the characterized formations are assumed to be well-described by a transversely isotropic (TI) model consisting of up to five independent parameters, and inversion results are commonly reported following Thomsen's notation (i.e., in terms of $VP0$, $VS0$, ϵ , δ , and γ). Sonic slowness measurements can be augmented with auxiliary data from published core measurements, to also provide plausible logs of fractured VTI (FVTI) moduli.

In this one-day short-course, three active experts with over 20-30 years of experience each, working in the fields of sonic, microseismic, VSP and surface seismic depth imaging, will provide the fundamental knowledge necessary to understand, identify and estimate different types of elastic anisotropy, and will show how to integrate the measurements across different scales, from cores up to surface seismic.



TECHNICAL PROGRAMME

Short Course | Monday 18 November

VAN GOGH MEETING ROOM	
07:30	Registration & Morning Coffee
08:20	HSSE
08:30	Short Course: Advanced Elastic Anisotropy Calibration: From Borehole to Seismic Scales
10:00	Coffee Break
10:20	Short Course continues
12:00	Lunch Break @ The Gallery
13:00	Short Course Continues
15:00	Coffee Break
15:20	Short Course Continues
16:30	Short Course Concludes
18:00	Icebreaker Reception

Oral Presentations | Tuesday 19 November

GAUGUIN & DALI	
07:00	Registration & Morning Coffee
07:55	HSSE
08:00	Welcome and Workshop Aims (Co-Chairs)
08:15	Opening Address - Mr Wilfred Berlang (Shell)
08:30	KN01 - Evolving use Cases for Borehole Geophysics on Land for Discovery and Recovery - A. Bakulin (Saudi Aramco)
Session 1: Full Waveform Inversion/Acoustics Session Chairs: S. Alsaadan (Saudi Aramco) & E. Verschuur (Delft University)	
09:00	BG1 - Application of 2D Elastic Full Waveform Inversion to Walkaway VSP Data from a Carbonate Reservoir - E.M. Takam Takougang ^{1*} , M.Y. Ali ¹ , Y. Bouzidi ¹ , F. Bouchaala ¹ , A.A. Sultan ¹ , A.I. Mohamed ¹ ¹ Khalifa University
09:25	BG2 - Potential and Challenges of 3D Joint Migration Inversion of 3D Borehole and Surface Seismic Data - B. El-Marhoul ^{1*} , D.J. Verschuur ¹ , M. Verliac ² , V. Lesnikov ² ¹ Delft Studio for Imaging; ² Total
09:55	Coffee Break
10:30	BG3 - Quantitative fracture imaging using least-squares migration and linear-slip model: theory and application to single-well reflection imaging - S. Minato ^{1,2*} , R. Ghose ¹ , K. Wapenaar ¹ ¹ Delft University of Technology; ² OYO Corporation
10:55	BG4 - Crosswell Nonlinear Seismic Waveform Inversion Without Downhole Sources and its Application to Time-lapse Monitoring - S. Minato ^{1,2*} , R. Ghose ¹ ¹ Delft University of Technology; ² OYO Corporation
11:20	Panel Discussion
12:00	Lunch Break @ The Gallery

Session 2: Pushing Processing Technology I

Session Chairs: H. Simpson (Baker Hughes) & Z. Patval (Halliburton)

13:00	BG5 - 3D Full Wavefield Imaging of 3D Borehole Data in a Complex Salt Environment - B. El-Marhoul ^{1*} , D.J. Verschuur ¹ , M. Verliac ² , V. Lesnikov ² ¹ Delphi Studio for Imaging; ² Total
13:25	BG6 - Imaging Complex 3D Structures, Applying 3C Vector Migration to VSP Data - J. Haldorsen ^{1*} , L. Jahren ¹ ¹ Independent
13:50	BG7 - Improving Subsurface Images for Better Reservoir Management by CT-DAS-VSP in a Production Well Onshore Japan - Y. Uematsu ^{1,2*} , Y. Kobayashi ^{1,2} , S. Mochiji ^{1,2} , Z. Xue ^{1,3} ¹ Geological Carbon Dioxide Storage Technology Research Association (GCDS-TRA); ² INPEX Corporation; ³ Research Institute of Innovative Technology for the Earth (RITE)
14:15	Poster Introductions
14:30	Extended Coffee Break & Poster Session A

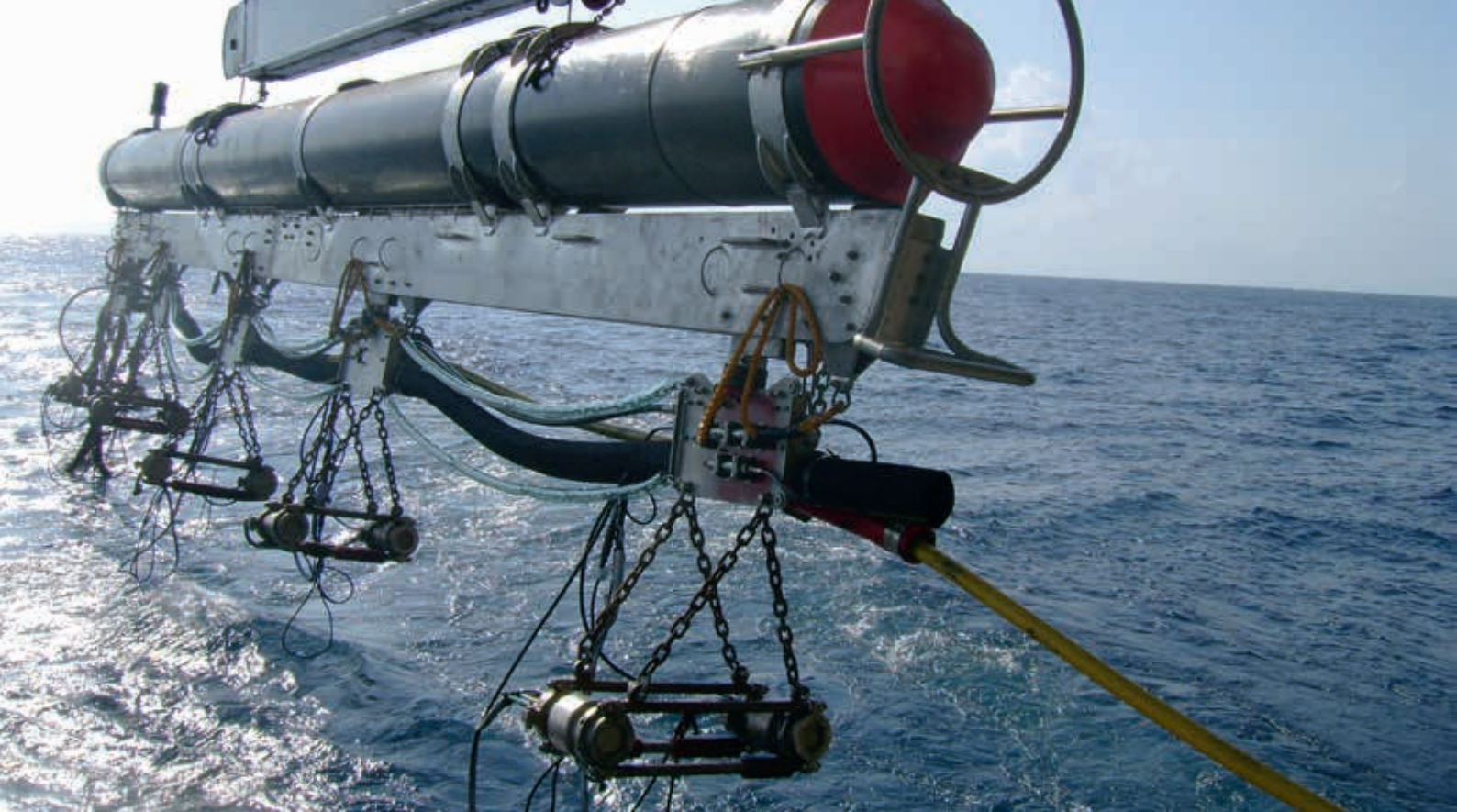
Session 3: Pushing Processing Technology II

Session Chairs: J. B. U. Haldorsen (Independent Consultant) & V. Lesnikov (Total)

15:15	BG8 - Improving Walkaway VSP images via deploying optimum imaging methods: Gaussian Beam Migration and Reverse Time Migration - N. Palacios ^{1*} , N. El Yadari ¹ ¹ Saudi Aramco
15:40	BG9 - VSP Acoustic Imaging-Inversion - H. Liang ¹ , K. Osypov ^{1*} , H. Zhang ¹ ¹ Aramco Services Company; Aramco Research Center-Houston
16:05	BG10 - Integrated Anisotropic Model Building and Imaging Using a Hybrid Cable DAS VSP - S. Leany ^{1*} , T. Cuny ¹ , E. Velez ¹ , T. Mizuno ¹ , C. Chapman ¹ , M. Perez ² , D. Lawton ³ , K. Imanen ³ ¹ Schlumberger; ² Velvet Energy; ³ University of Calgary
16:30	BG11 - Imaging Velocity Anomalies Using DAS VSP Tomography - M. Willis ^{1*} , R. Zhou ¹ , D. Cheng ¹ , X. Zhao ¹ , J. Carrillo Rangel ¹ , G. Knapo ¹ , D. Braman ² , S. Brackeen ³ , E. Nelson ³ ¹ Halliburton; ² DBX Geophysical; ³ Primexx Energy Partners
16:55	Panel Discussion
17:30	Close of Day

Poster Presentations | Tuesday 19 November

REMBRANT	
Poster Session A	
14:30	Extended Coffee Break & Poster Session A
	P01 - An Efficient Dip Filtering Approach to Improve VSP Imaging Quality - M. Lou ^{1*} , H. Simpson ¹ ¹ Baker Hughes
	P02 - Velocity Estimation Below the Well Bottom by Using FWI: Application to Walkaway Synthetic Seismic Data - C. Barnes ^{1,3*} , M. Verliac ² ¹ University of Cergy-Pontoise; ² TOTAL S.A.; ³ GIM-labs
	P07 - Towards a Near-Surface Velocity Model of Groningen using Transdimensional Markov Chains - A. Rahimi Dalkhani ^{1*} , E. Ruigrok ^{2,3} , C. Weemstra ^{1,3} ¹ Delft University of Technology; ² Utrecht University; ³ R&D Seismology
	P04 - High-resolution Processing of VSP Data - J. Haldorsen ¹ , M. Milenkovic ^{1*} ¹ Independent Consultant
	P05 - Receiver Decimation and Impact on DAS VSP Data Processing Quality - D. Cheng ¹ , X. Zhao ^{1*} , M. Willis ¹ , R. Zhou ¹ , D. Quinn ¹ ¹ Halliburton



Oral Presentations | Wednesday 20 November

GAUGUIN & DALI	
07:30	Morning Coffee
08:00	KN02 - Machine Learning: Separating Fact from Myth & The Need for Developing a New Literacy - J. van de Mortel (Independent Consultant)
Session 4: Time Lapse Reservoir Monitoring Session Chairs: J. Bailey (VSProwess) & S. Oates (Shell)	
08:30	BG12 - Timelapse DAS VSP Viscoelastic FWI for CO2 Monitoring - M. Charara ^{1*} , C. Barnes ^{2,4} , T. Tsuchiya ³ , N. Yamada ³ ¹ Skolkovo Institute of Science & Technology; ² University of Cergy-Pontoise; ³ NC Geophysical Survey; ⁴ GIM-labs
08:55	BG13 - Designing Cross-Well Seismic for Fiber Optics: A Case Study for the Svelvik CO2 Test Site - A. Wuestefeld ^{1*} , W. Weinzierl, W. ² , A. Romdhane ³ ¹ NORSAR; ² GFZ; ³ SINTEF
09:20	BG14 - DAS VSP for Characterisation and Monitoring of the CO2 Shallow Release Site: CSIRO In-Situ Laboratory Case Study - K. Tertyshnikov ^{1*} , R. Pevzner ¹ , B. Freifeld ² , L. Ricard ³ , A. Avijegon ³ ¹ Curtin University; ² ClassVISolutions; ³ CSIRO
09:45	Panel Discussion
10:15	Coffee Break
Session 5: Microseismic Monitoring I Session Chairs: J. van de Mortel (Independent Consultant) & W. Wills (Avalon Sciences)	
10:40	BG15 - Borehole Monitoring Technologies for CO2 Storage Containment Verification - M. Dean ^{1*} , S. Bourne ¹ , O. Tucker ² ¹ Shell Global Solutions International; ² Shell International Petroleum Company Ltd
11:05	BG16 - Detecting Hydraulic Fractures Using Rapid Time-Lapse DAS VSP - M. Willis ^{1*} , R. Zhou ¹ , W. Palacios ¹ , G. Knap ¹ ¹ Halliburton

11:30	BG17 - Innovative Two-stage Traveltime Inversion for Locating Microseismic Events - A. Alramadhan ^{1*} ¹ Saudi Aramco
11:55	BG18 - Reviving Reverse VSP: Good Old Technique for the Near Surface High Resolution Imaging and Rapid Monitoring * The work has been supported by the Mineral Exploration Cooperative Research Centre whose activities are funded by the Australian Government's Cooperative Research Centre Programme - R. Pevzner ^{1*} , K. Tertyshnikov ¹ , S. Popik ¹ , E. Sidenko ¹ ¹ Curtin University
12:20	Lunch Break @ The Gallery
Session 6: Microseismic and Monitoring II Session Chairs: R. Guerra (Schlumberger) & S. Oates (Shell)	
13:20	BG19 - Case study: Microseismic monitoring applications at Saline of Vauvert - J. Barnavol ^{1*} , E. Fortier ¹ , O. Claude ² ¹ Baker Hughes; ² KemOne
13:45	BG20 - DAS VSP Monitoring for CO2 migration tracking in a carbonate reservoir - L. Grindei ^{1*} , M. Humphries ¹ , M. Kelley ² , A. Modroo ³ , T. Coleman ⁴ ¹ VSProwess; ² Battelle; ³ Core Energy; ⁴ Silixa
14:10	BG21 - Multi-well DAS Observations for Hydraulic Fracture Monitoring - S. Cole ¹ , M. Karrenbach ^{1*} ¹ OptaSense
14:35	Special Presentation - The Hague: Overview of the Local Energy, Oil & Gas Industry Laurens Kok - Head of Foreign Investments The Hague Business Agency / City of The Hague
15:00	Panel Discussion
15:30	Close of Day
16:00	Sightseeing Tour - Mauritshuis
19:30	Workshop Dinner @ Catch by Simonis

Oral Presentations | Thursday 21 November

GAUGUIN & DALI	
08:00	Coffee Break
08:30	KN03 - Minimizing the Sound Levels and Environmental Impact of Marine Borehole Seismic Sources - J. Tulett ^{1*} ¹ Schlumberger
Session 7: Acquisition Hardware Methods Session Chairs: O. Valishin (Sercel) & W. Wills (Avalon Sciences)	
09:00	BG22 - A Systems Approach to Distributed Fiber-optic Sensing - M.Karrenback ^{1*} ¹ OptaSense Ltd
09:25	BG23 - Comparison of VSP Data with Geophones and DAS Behind Casing in a Shallow Land Well - A. Aldawood ^{1*} , H. Merry ² , A. Bakulin ¹ ¹ Saudi Aramco; ² Aramco Services Company
09:50	Poster Introductions
10:05	Extended Coffee Break & Poster Session B
10:50	BG24 - Downhole DAS Observation of Guided Waves in a Shale Reservoir Generated by Perforation Shots - A. Lellouch ^{1*} , B. Biondi ¹ , M.A. Meadows ² , S. Horne ² , T. Nemeth ² ¹ Stanford University; ² Chevron Energy Technology Company
11:15	BG25 - Analysis of Casing Deformation in Shale Gas by Using Microseismic and Seismic Comprehensive Interpretation Techniques - F. Heng ^{1*} , Q. Jin ¹ , G. Xu ¹ , T. Liu ¹ and X. Huang ¹ ¹ BGP, CNPC
11:40	Panel Discussion
12:05	Lunch Break
Session 8: Integration with Surface Seismic Data Session Chairs: J. Bailey (VSProwess) & E. Verschuur (Delft University)	
13:05	BG26 - Refining VSP Imaging Results in Complex Geology by Integrating Sonic TI-Anisotropy - R. Guerra ^{1*} , A. Martinez ¹ , K. Jennings ³ , E. Wielemaker ¹ ¹ Schlumberger Wireline; ² Karoon Brazil
13:30	BG27 - Calibration of PP and PS Surface Seismic Events Using Borehole Seismic while Drilling Data - M. Cox ^{1*} , P. Tynan ¹ , E.J. Kjos ² , H.H. Veire ² , V. Dahl-Eriksen ² , F. Jakobsen ² ¹ Baker Hughes; ² Aker BP
13:55	BG28 - VTI Anisotropy Analysis from 3D Seismic, VSP and Logs in the Timan-Pechora Region - S.A. Tcherkashnev ^{1*} , A.V. Mitin ¹ , A.U. Andreev ² , I.N. Kerusov ³ ¹ Weatherford International plc; ² LUKOIL PJSC; ³ LUKOIL-Engineering LLC
14:20	BG29 - WAVI-VSP: Reducing Drilling Risk - H. Simpson ^{1*} , N. Randall ¹ , J. Banks ² , A. Mitra ² ¹ Baker Hughes; ² TOTAL North Sea UK Limited
14:45	Panel Discussion
15:15	Coffee Break
Session 9: Reservoir Characterisation Session Chairs: S. Alsaadan (Saudi Aramco) & H. Simpson (Baker Hughes)	
15:40	BG30 - Offset VSP Optimization in Structurally Complex Settings: An Example from Onshore Romania - P. Lyon ^{1*} , R. Guerra ² , L. Euranie ³ , I. Stoia ³ , E. Tyler ¹ ¹ OMV Petrom; ² Schlumberger Wireline; ³ Schlumberger SIS-DS
16:05	BG31 - Internal Salt Dome Reflections in VSP - M. Humphries ^{1*} , B. Lampe ² ¹ VSProwess Ltd; ² WSP USA
16:30	BG32 - Testing Advanced Imaging Algorithms on Multi Azimuthal Walkaway VSP Data for Improved Imaging of Sand Channel - H. Alnasser ^{1*} , Y.S. Kim ¹ , A. AlSaad ¹ ¹ Saudi Aramco
16:55	Panel Discussion
17:30	Close of Workshop

Poster Presentations | Thursday 21 November

REMBRANT	
Poster Session B	
10:05	Extended Coffee Break & Poster Session B
	P06 - DAS VSP Acquisition Through Coiled Tubing Fiber-Optic Cable - R. Guerra ^{1*} , T. Kimura ¹ , Y. Chen ¹ , Y. Kobayashi ^{2,3} , Z. Xue ² , K. Adachi ³ ¹ Schlumberger; ² Geological Carbon Dioxide Storage Technology Research Association; ³ INPEX CORPORATION
	P03 - A Methodology of Shot Point Regularization and Trace Interpolation in 3D VSP - M. Lou ^{1*} , H. Simpson ¹ ¹ Baker Hughes
	P08 - DrillCam Field Trial - Extracting the Weak Signals by Drill-bit noise Deconvolution - A. Aldawood ^{1*} , I. Silvestrov ¹ , Y. Liu ² , A. Bakulin ¹ ¹ Saudi Aramco; ² Aramco Far East Business Services Co.,Ltd.
	P09 - New Workflow for Estimating Seismic Wave Attenuation from 3D Surface Seismic Data - F. Bouchaala ^{1*} , M.Y. Ali ¹ , J. Matsushima ² , Y. Bouzidi ¹ , E.M. Takam Takougang, A.A. Awis Mohammed ¹ ¹ Khalifa University; ² The University of Tokyo



SOCIAL PROGRAMME

Icebreaker Reception

Monday 18 November, 18:00 – 20:00hrs

Lounge Bar & Great Room (Lobby area)

Group Excursion

Wednesday 20 November, 16:00-19:00

Mauritshuis

Home to the very best of Dutch Golden Age painting.
Plein 29, 2511 CS Den Haag

Workshop Dinner

Wednesday 20 November, 19:30 - 21:30

Catch by Simonis

Located in the Scheveningen marina
Dr. Lelykade 43, 2583 CL Den Haag

DEADLINES

Registration Open	1 August 2019
Registration Close	12 November 2019

OVERVIEW OF REGISTRATION FEES

Short Course Registration Fees

REGISTERED AND PAID	1 August - 1 November
EAGE Member	€ 480
Non-Member	€ 520

Workshop Registration Fees

REGISTERED AND PAID	1 AUGUST - 18 OCTOBER	19 OCTOBER - 12 NOVEMBER	ONSITE
EAGE Member	€ 795	€ 895	€ 895
EAGE Student Member	€ 400	€ 450	€ 450
Non-member	€ 995	€ 1095	€ 1095
Student Non-member	€ 450	€ 500	€ 500

All fees are in Euros (€). One Euro of your total registration fee is donated to the EAGE Green Fund.

Please note: The deadlines are following the Local Time in the Netherlands.

Members please note: To qualify for the member registration fee, your EAGE membership dues for 2019 must have been paid and confirmed. The processing time for membership applications or renewals is 10 working days.

To qualify for the reduced student registration fee:

- Students must be enrolled in a full time study programme at a recognized university or institute
- The registration must be accompanied by a copy of a student ID card and/or official proof of enrolment.

Please note: Student non-members cannot be older than 34 years of age (when registering). The non-member fee includes EAGE membership for the remainder of 2019.

Please note that EAGE reserves the right to cancel the short course or workshop due to low participation. In this case, payment will be refunded in full.

VENUE

The Fifth EAGE Workshop on Borehole Geophysics will be held at:

The Hague Marriott Hotel

Address: Johan de Wittlaan 30, 2517 JR Den Haag
(The Hague), The Netherlands
Phone: +31 70 352 5354

SPONSORSHIP

Thank you to our sponsors for their generous contribution to this workshop.

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Ice Breaker

HALLIBURTON

Short Course Partner & Coffee Break



Group Excursion

The Hague.

& Partners



COMPANY DISPLAY AREA

Alongside the technical programme there will be a company display area showcasing borehole geophysics related technologies (hardware, software, videos, posters etc) from the below companies

Sercel



As the world's leading designer and manufacturer of innovative seismic equipment and reservoir monitoring instruments, Sercel provides oil field service companies and geophysical contractors with the widest range of leading-edge technologies for exploration in land, marine, ocean bottom, transition zone and reservoir environments. Employing more than 1,500 people worldwide, Sercel's main sales offices are located in Nantes (France) and Houston (USA).

More information about Sercel is available at www.sercel.com

Avalon Sciences Ltd



Avalon Sciences Ltd (ASL) designs and manufactures advanced borehole seismic equipment for Vertical Seismic Profiling (VSP), permanent/passive seismic monitoring, well/reservoir characterisation and hydraulic fracture event detection. Our innovative product line offers deployment in the harshest of well conditions along with developing fibreoptic and DAS technology. More information about Avalon Sciences Ltd (ASL) is available at www.avalonsciences.com

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